

57 U04 What if? Submarines off Cronstadt and Sevastopol?

by Dr Douglas J Austin U 04

Under "*Foreign Intelligence*" for 28th July 1856, "*The Times*" of London reported:- "If we are to believe a very circumstantial letter from Munich, Britannia's maritime power has had a very narrow escape from the total destruction which awaited it had a third naval campaign been opened this year in the Bay of Finland. From this letter we learn that a certain Bavarian corporal, named Bauer, who, in 1849, made some unsuccessful experiments with a diving vessel in Kiel harbour, has since then brought his labours to a successful result; the letter which he wrote home announcing this fact was indited 17 feet below the surface of the sea, off Cronstadt, June 24, and in the company of the writer, in his vessel, were at the time a Russian naval officer, eight sailors and a smith. This experiment had been preceded by eight others for the purpose of testing the capacity of the vessel, and it was to be succeeded in a few days by a grander one in the presence of the Grand Duke Constantine and a committee named for the purpose. On the occasion here alluded to the crew of 11 persons remained eight hours, without interruption, under water; and, in addition to the letter-writing feat and the drinking of divers bottles of Rhine wine to the health of various European potentates, they performed during that time all sorts of evolutions with the vessel moving, backwards and forwards, rising and sinking whether vertically or at an angle, whether rapidly or slowly, &c. In short, the only circumstance connected with the description that at all suggests an opening for scepticism is, that the letter was written by the inventor [*Bauer*] himself; when we have another description, written by an impartial person, we shall know better what to think about the matter."

Certainly, the early concepts of submarine navigation were vigorously explored long before that report. The multi-talented Charles Babbage (1791-1871), after his experience with a diving bell in 1818, published an article on "*Submarine Navigation*" in "*The Illustrated London News*" on 23rd June, 1855, during the second campaign in the Baltic. That article reprinted his entry in the "*Encyclopaedia Metropolitana*", 18, 157-67, (1826), with his fanciful design for an open submarine vessel effectively moved by a rowing-action from the inside, with horizontal and vertical "rudders" and with adequate air for four persons to last more than two days. He proposed a form of floating "snorkel" with a pump to draw down fresh air. "If it should be feared that the float would discover the boat to an enemy, it might easily be disguised in the form of a sea-bird."..."The diving-boat may be employed for two different objects, either as a moveable diving bell, or as a mode of crossing undiscovered a considerable distance of water". In 1855, he added several ideas for improvement and mentioned the 1847 work of Dr Prosper Antoine Payerne in Paris and Cherbourg, sponsored by the French government, and in New York thereafter. He concluded: "These facts must have been unknown to the English Government in the autumn of last year (1855); for it was stated that diving-bells, divers, and apparatus were sent out to enable the fleet to blow up the obstructions at the entrance of the harbour of Sebastopol, as soon as the army should succeed in taking that place." Babbage did not specify any armament, other than the laying of charges under sunken vessels.

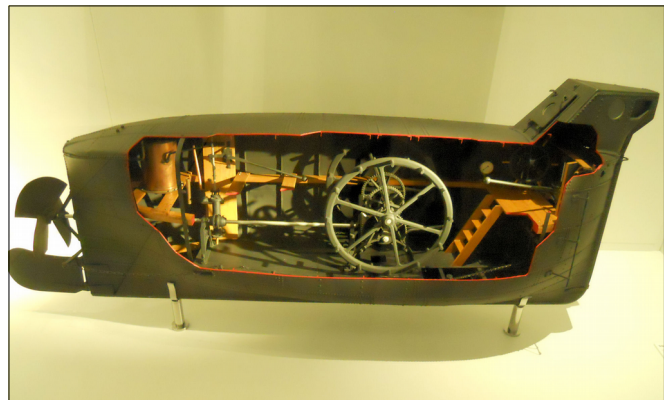
Previously, the following notice had appeared in the "*Court Circular*" of "*The Times*" for Friday, 6th August, 1852:- "M. Wilhelm Bauer had the honour of exhibiting his machine for marine locomotion before Her Majesty and his Royal Highness Prince Albert, at Osborne, on Monday last." Wilhelm Bauer is widely credited with innovations in submarine technology - and is honoured in Germany to this day.¹ I have searched Queen Victoria's journal entries (as edited by HRH Princess Beatrice)² :- "Monday 2nd August 1852:- "...In the afternoon I went on board the "*Fairy*"³ with Mama, Feodore, her children, our girls & our Ladies & Gentlemen, remaining there to see a really very curious invention of a Bavarian gentlemen, Herr Bauer, viz: a boat which goes under the water, dives & is driven of itself, & which can be used instead of a diving bell. Albert & the Boys were in one of our boats to watch it, while in another small one were the inventor & Becker.⁴ They

came quite close to the "*Fairy*". The boat was only a small model, which looked like a fish, & which was very wonderful, the inventor propelling it by a spring. The large one he has constructed, contains several men, & he was able to remain in it 6 hours under water! Just as he was exhibiting it for the last time, the string broke, & he lost it! It was most distressing & I could have cried for the poor man who seemed quite in despair. Some of the men dived for it, but it could not be found! Albert kindly let him know, that he was in no way shaken in his opinion of this great invention & will see him tomorrow...". "Tuesday 3rd August 1852:- "...Albert has very kindly given that poor inventor of the boat, sufficient money (for he had only £4 left) to go back to Hamburg, where he will start building another boat, & a better one, making an experiment for a new steam propeller...". The Prince Consort's interests are surely marked by his courtesy to the unfortunate inventor.

Noting the claims made for Bauer's "large one", Wikipedia has it that "*Brandtaucher*" (German for "*Fire-diver*") was a submersible designed by the Bavarian inventor and engineer Wilhelm Bauer and built by Schweffel & Howaldt in Kiel for Schleswig-Holstein's Flotilla (part of the Reichsflotte) in 1850. In January 1850, Bauer - a cavalryman during the German-Danish War - designed his "*Brandtaucher*" as a way to end the Danish naval blockade of Germany. Bauer's early sketch attracted the attention of the Minister of Marine, who allowed him to construct a 70×18× 29 cm (27.6×7.1×11.4 in) model. [*This may have been the clockwork model shown to Queen Victoria in 1852.*] The model was demonstrated in Kiel harbour in front of naval dignitaries. Its satisfactory performance led to the construction of a full-scale model, which was funded by contributions from army personnel and local civilians. Due to inadequate funding, the scale of the boat had to be downgraded and the design altered and simplified; resulting in a reduced diving depth from 30 m to 9.5 m. This redesign included eliminating the use of enclosed ballast tanks to contain the water being taken into and expelled from the submarine. Instead, the water was allowed to pool inside the bottom of the hull, below the main floor, and was able to move relatively unobstructed within this area when the ship changed orientation. The resulting instability was probably a significant contributing factor to the loss of the vessel. As built, the "*Brandtaucher*" was 8.07 m long and 2.02 m at maximum beam, with a draught of 2.63 m. It was propelled by a crew of three turning large tread-wheels connected to a propeller. The boat could reach a speed of three knots, but this could not be maintained for long periods of time.



"*Brandtaucher*" (Dresden)



"*Brandtaucher*" (Model)

On 1 February 1851, "*Brandtaucher*" sank after a diving accident during acceptance trials in Kiel Harbour. The submarine experienced equipment failure, and sank to the bottom of a 60-foot hole at the bottom of Kiel Harbour. Bauer escaped by letting in water, thus increasing the air pressure, which allowed him and his two companions to open the hatch and swim to the surface. This was the first submarine escape to be witnessed and reported. The wreck was raised in 1887 and was placed on display at the Naval Academy in Kiel, moving to the Museum für Meereskunde in Berlin in 1906. From 1963 to 1965 it was restored at Rostock, and displayed at the Nationale

Volksarmee Museum in Potsdam. The boat can now be viewed at the Militärhistorisches Museum der Bundeswehr (German Armed Forces Museum of Military History), in Dresden."

A very fine and detailed account of "**British submarine policy 1853-1918**" - by Michael Wynford Dash (Ph.D. thesis, King's College, London, 1990) - is available for download ⁵ and is well worth reading. In particular, Chapter 1.2, entitled "**British Submarine Policy during the Crimean War**" (pp 34-46) provides detailed information about the interactions of Wilhelm Bauer, the Prince Consort and the engineer John Scott Russell. From that, I extract:- "Predictably enough, the Admiralty was unimpressed by the invention. On 26 August 1854, however, the Surveyor's Department took the unusual step of re-examining Bauer's scheme, asking no less a figure than Professor Michael Faraday to come to the Admiralty to interview him..." "**Der Brandtaucher**" was unsalvageable, and the inventor eventually left Germany for Austria and then Britain. By the time he reached London, Wilhelm Bauer had demonstrated his model submarine to Ludwig I of Bavaria, to his successor, Maximilian II, and to the young Austro-Hungarian emperor Franz Joseph. The second and far more compelling reason for Admiralty interest in Bauer was the patronage the Bavarian secured from Prince Albert. Arriving in Britain late in the summer of 1852 he demonstrated his model submarine to the Royal family at Osborne, and Albert was sufficiently impressed to provide Bauer with the funds to construct another model when the first was lost...By acquiring so powerful a supporter, Bauer ensured he would be treated with respect. Indeed the Admiralty's first contact with the inventor was made at the instigation of the Prince Consort, who wrote to Sir James Graham, the First Lord, to request a prompt investigation. The RN's willingness to reinvestigate Bauer's proposals in 1854 may also be attributable to the fact that the German projector's plans took on a much more concrete form between July 1853 and August 1854. At Prince Albert's suggestion, he was introduced to the noted naval architect John Scott Russell late in 1853. Russell owned a shipyard at Millwall on the Isle of Dogs...as the inventor of the double bottom, pioneer of the wave-line system of shaping vessels, and co-founder of the Institute of Naval Architects, the Englishman was well qualified to help Bauer construct a new submarine. Bauer moved down to Greenwich, and by August 1854 had fleshed out a new set of plans. Russell's contribution was to help the poorly-educated, intuitive Bavarian to present his ideas in a form acceptable to the Surveyor's Department, but no submarine was laid down in the Millwall yard prior to the submission of 26 August. Bauer and Russell may well have hoped to persuade the Admiralty to back the project before incurring major expense. If so, they were unsuccessful. Bauer's lack of English (he spoke through an interpreter) and mistrustful nature combined to make him an unsatisfactory witness, and two days after the meeting he was "acquainted that his explanations have not been sufficiently distinct." Shortly thereafter Bauer became convinced that his co-workers were poaching his ideas. He had proved equally suspicious of French collaborators during a brief trip to Paris in 1853, but by now the Crimean War was under way and the inventor took himself and his plans to Russia. There, with the patronage of Grand Duke Constantine, the Minister of Marine, he built a large submarine, "**Le Diable Marin**", which was intended to attack the Allied Fleet in the Baltic. This boat was quite successful and conducted numerous trials in the waters off Cronstadt. ⁶ "Bauer's departure for Russia passed unnoticed in the scramble to prepare a British fleet for operations in the Baltic. The Royal Navy had entered the Crimean War quite unprepared to meet the special problems that were to confront it; its line-of-battle fleet was unsuited to operations in the restricted waters of the Gulf of Finland, and a host of unusual vessels had to be designed to meet these new conditions. Suddenly innovation was at a premium. Gunboats, mortar vessels, armoured rafts and floating batteries were built in numbers. Meanwhile, the Russian 'fleet in being' at the great naval base of Cronstadt controlled the approaches to St Petersburg and prevented the Allied fleet from gaining command of the strategically vital waters of the eastern Gulf. Cronstadt itself was protected by a great barrier, several miles long, stretched across the shallows outside the harbour. The Royal Navy had to break through this barrier before it could attack the Russian fleet. John Scott Russell revived the idea of building a submarine early in 1855. A new design was sketched with the help of the well-known civil engineer Sir Charles Fox, one of the principals of

Fox & Henderson, the firm that had built the Crystal Palace. Together the two men drew up the plans of a large mobile diving bell to be crewed by divers and used to destroy the barrier at Cronstadt. Whether or not Russell had been examining Bauer's plans behind the Bavarian's back, the new invention bore little relation to *Der Brandtaucher* or *Le Diable Marin*. Bauer designed screw-driven, completely enclosed boats. Russell's new craft, according to one officer who examined it, "was merely a large diving bell, like an inverted boat...It went down to the bottom with men under it; they were to walk along the bottom and propel the boat by pressing against against thwarts fixed to the under side." Crew members in diving dress were to leave the vessel and attach explosives to the target. Russell and Sir Charles Fox seem to have drawn more consciously on the inspiration of a French designer, Dr Payerne, who built the submarine *L'Hydrostat* in 1846 and later converted her into a diving bell. In her new guise Payerne's boat was successfully employed in the construction of a breakwater for Cherbourg harbour...With the support of Palmerston and Prince Albert (who had kept up his interest in submarine warfare), the Fox/Russell submarine was nevertheless ordered on 22 March 1855 and launched on 5 October. She carried a crew of 12, most of whom were employed in sculling the boat along at her maximum surface speed of two knots. Russell hoped that his oarsmen would also be able to row the submarine while submerged but this dangerous technique was never tried, the boat's captain, Chief Diver McDuff (who had been strictly enjoined by Russell "to train his men gradually, and on no account drown any of them"), reporting that "there must be several descents before the men will have sufficient confidence to propel her under water; although they are willing, still they are timid." McDuff's caution was entirely justified. Although the submarine killed no-one, there were some exceedingly narrow escapes. Anxious for secrecy, the designers sent the boat to the seclusion of Poole Harbour and persuaded a reluctant Admiralty to appoint a committee to examine their invention. The three officers selected were Captains Bartholomew Sullivan, Astley Cooper Key and James Hope. The first was a brilliant hydrographer, whose surveys of the Baltic and the approaches to Cronstadt had made him thoroughly familiar with the waters in which the submarine would have to operate. Of the latter two, Key (whose name had been suggested by John Scott Russell) was a noted technical officer and future Senior Naval Lord, Hope, another talented scientist, presided over the HMS Captain court martial and became an Admiral of the Fleet. The initial investigation was not very thorough; the commissioners remained in London and contented themselves with examining the inventors, the captains of the submarine and her tender, and some Thames divers who testified to the difficulty of seeing any distance under water. Key, Sullivan and Hope then reported that although the boat might be useful in other circumstances, the murky waters off Cronstadt would preclude her successful employment there. The matter might, perhaps, have ended there, but a copy of the committee's report was sent by Wood to the Prince Consort. Outraged that the three naval officers had not seen Scott Russell's craft in action, Albert wrote to Palmerston insisting that the invention should not be forgotten. Wood's response was to reconvene the committee, and late in January 1856 he sent its members to Dorset to examine the submarine. Both Hope and Sullivan were optimistic that the boat would be a success in the clearer waters of the south coast, but they were severely disappointed by the trial that took place at Poole on 25 January 1856. While the Admiralty committee watched from Scott Russell's tender, McDuff and his crew completed a preliminary dive. Then they submerged again, and a buoyed air hose (*cf. Babbage, above*) advancing slowly across the harbour marked their progress through the icy sea. After 20 minutes, the prow of the submarine suddenly shot out of the water, blew like a whale and went down again. Moments later the boat reappeared briefly before slipping back in a swirl of water. Soon those at the surface heard the sounds of a hammer being struck against the iron sides of the submarine. This was the agreed distress signal, and the craft was hurriedly brought to the surface by a safety line which Russell had thoughtfully attached to her beforehand. The crew were pulled out, gasping but alive, to explain that they had become stuck in a patch of Poole mud. McDuff had attempted to surface, but one of the two weights that had to be released snagged on some obstruction. The other end of the submarine rose unchecked to the surface and most of the air escaped. The Chief Diver's presence of mind saved his crew, for he gathered the men by one of the tanks of compressed air used to keep the sea out of the boat, and fed

them oxygen while they waited to be rescued. This concluded Britain's first official submarine trial. Not surprisingly, the Admiralty officers left Poole in what Russell termed "a state of considerable alarm and disappointment." They retrieved their earlier report, which they now considered too favourable, and submitted a second, more damning indictment of the submarine. The boat was brought back to London and left to rust."

From "*The Story of the Submarine from the Earliest Ages to the Present Day*" by Lt-Colonel Cyril Field, London: S. Low, Marston & Co., 1908, I extract (pp 85-94):- "Bauer and his invention were at once at a discount in this country, although it is said that his plans were retained or copied by some of his assistants in the building of the ill-fated boat. Anyway, Scott Russell brought out a submarine a year or two later which bore a very suspicious resemblance to a boat that Bauer built about this time for the Russian Government called the *Diable Marin*. It was intended to be employed at the siege of Sebastopol, and cost the Government £7000 to build. She was to be propelled by oars pulled by men in diving-dresses supplied with air by a tube with a funnel-shaped float. It also sank on its trials and drowned the crew. After leaving England Bauer had approached the Government of the United States, but they would not have anything to do with him. He next went to Russia, then at war with England, France and Turkey, where he was taken up by the Grand Duke Constantine and built the *Diable Marin* referred to above. The new boat was 52 feet long and over 12 feet wide, and was somewhat of the same shape as the ill-fated *Brandtaucher*. It was propelled by a single screw driven by gearing connected with a kind of treadmill which was 7 feet in diameter. When it was desired to descend, water was pumped into three big cylinders, 10 feet high and 4 feet 6 inches in diameter. To ascend they were, of course, emptied again. There was a smaller cylinder whose duty was to keep the boat steady - a kind of ballast tank. The mode of attack by the *Diable Marin* was to be a somewhat curious one. A big mine holding 500 lb. of powder was carried forward, and to fasten this to the bottom of an enemy's ship a pair of long, thick india-rubber gloves were fitted to the hull of the vessel so that a man standing right forward and looking through a pair of thick glass scuttles provided for the purpose, could put his arms into the gloves, detach the mine, and affix it where required. There was an opaque black fog hanging round Cronstadt in the small hours of the morning of May 26, 1856, and a sentinel perched up on some of the immense granite fortifications that had held the British Baltic Fleet so long at bay suddenly saw a mysterious object floating close to his post. Presently he discerned a man standing upon it, and challenged. To his surprise he received the correct countersign, and, bewildered and alarmed at what he considered a supernatural manifestation, he threw down his rifle and took to his heels. This was about three in the morning. Sentry after sentry was equally flabbergasted, and so Bauer made a kind of triumphal entry into the impregnable harbour. After this the inventor carried out a very large number of successful trials with his boat. Submerged 17 feet under water he wrote letters to his Russian patron, to the King of his own country, and to his mother. When Alexander II was crowned (*September 7, 1856*), Bauer shipped a band of four musicians and celebrated the occasion by having the Russian National Hymn played under water while his crew joined in with the words. He was submerged for four hours while this ceremony went on. It is not known whether he found out if the fishes had any ears for music or not. But somehow or other Bauer seems to have got himself disliked in naval circles. Possibly he bored people with his inventions and projects. They wanted to get rid of him, and so endeavoured to find out something his boat could not do. He was told to pass under a certain ship that lay in very shallow water, but he was not informed of the depth. The consequence was that the propeller got entangled in a mass of seaweed and could not be extricated. Bauer only just managed to save his life and those of his crew by pumping out all the water and letting go the emergency safety weights. Up came the bow to the surface and they scrambled out, all but Bauer, who was still engaged below. He held on till a sudden inrush of water drove him out. This is said to have been his one hundred and thirty-fourth experiment in submarine navigation, which shows what an indefatigable and pertinacious inventor he was. But after this the Russians had had enough of him; and after he had raised his *Diable Marin*, a job which took him four weeks of incessant hard work, a final disaster overtook him in the total loss of his boat, which

went down in deep water off Ochda, a long way from land. According to one account she was deliberately taken out and sunk by order of the Russian Admiralty. Then he was ordered to build a submarine corvette to carry 24 guns, and this was followed by an intimation that he should betake himself to Siberia in order that he might the better keep her construction a State secret. This was the last straw. Bauer saw that the Russian Government was bent on making things unpleasant for him, and asked permission to quit the country. Four times had he to make this request before it was granted. He wandered to France, Switzerland, and back to his native land, often in dire distress from want of funds. His last attempt in the direction of submarine navigation was in 1861, when he attempted to float a company in Germany for the construction of a novel submarine which he entitled a "*Bruleur des Côtes*". But sufficient money was not forthcoming, the project fell through, and at length his determination to succeed gave way. Worn out by repeated disappointments he settled in Munich, where he fell into a decline and, after being bedridden for seven years, died in 1875, aged 53. So died Wilhelm Bauer, a clever man, cool, brave and determined, but the victim of never-ending ill-luck."

Summary:

While no submarines were deployed during the Crimean War, it appears that only the lack of official support, unfortunate timing and ill-luck prevented their development to at least a threatening state. I am lost in admiration of the ingenuity and bravery of the early submarine pioneers.

¹ U2540 is a Type XXI U-boat of Nazi Germany's navy (Kriegsmarine), completed shortly before the end of World War II. She was scuttled at the end of the war, never having gone on patrol. In 1957, she was raised from the seabed off Flensburg Firth and recommissioned in the West-German Bundesmarine in 1960. On relaunch she was renamed "*Wilhelm Bauer*". Decommissioned in 1980, she is the only floating example of a XXI U-boat (<http://www.u-boot-wilhelm-bauer.de/en/>)

² <http://www.queenvictoriasjournals.org/home.do>

³ HMY "*Fairy*" was a small royal yacht and tender to the HMY "*Victoria and Albert*". Built in 1844 by Ditchburn and Mare at Leamouth, she served from 1845 to 1863 and was broken up in 1868. Very useful on royal tours, she proved extremely convenient as a ferry between Portsmouth and the Isle of Wight where her shallow draft allowed her to berth at Trinity Pier (for Osborne House).

⁴ Dr Ernst Becker, photographer to Queen Victoria.

⁵ <https://kclpure.kcl.ac.uk/portal/en/search.html?searchall=dash>.

⁶ Kronstadt was founded by Tsar Peter the Great in 1704 as a maritime fortress and naval base on Kotlin Island, 19 miles west of St. Petersburg. The port is ice-bound for 140–160 days in the year, from the beginning of December to April